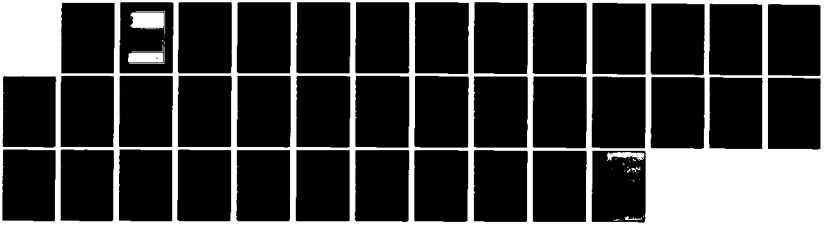
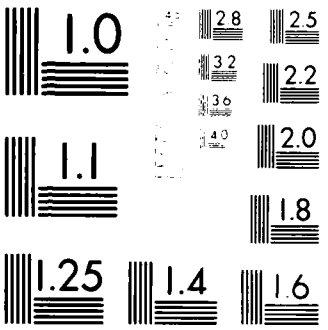
AD-A147 647 AGARD BULLETIN TECHNICAL PROGRAMME 1985(U) ADVISORY 1/1
GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT
NEUILLY-SUR-SEINE (FRANCE) AUG 84 AGARD-BULL-84/2
UNCLASSIFIED F/G 20/4 NL





AGARD-BUL-84/2

AGARD-BUL-84/2

AGARD

ADVISORY GROUP FOR AEROSPACE RESEARCH & DEVELOPMENT

7 RUE ANCELLE 92200 NEUILLY SUR SEINE FRANCE

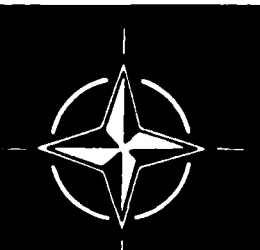
AGARD BULLETIN

TECHNICAL PROGRAMME 1985

★

AUGUST 1984 84/2

NORTH ATLANTIC TREATY ORGANIZATION



THE MISSION OF AGARD

The mission of AGARD is to bring together the leading personalities of the NATO nations in the fields of science and technology relating to aerospace for the following purposes:

Exchanging of scientific and technical information;

Continuously stimulating advances in the aerospace sciences relevant to strengthening the common defence posture;

Improving the co-operation among member nations in aerospace research and development;

Providing scientific and technical advice and assistance to the North Atlantic Military Committee in the field of aerospace research and development;

Rendering scientific and technical assistance, as requested, to other NATO bodies and to member nations in connection with research and development problems in the aerospace field;

Providing assistance to member nations for the purpose of increasing their scientific and technical potential;

Recommending effective ways for the member nations to use their research and development capabilities for the common benefit of the NATO community.

The highest authority within AGARD is the National Delegates Board consisting of officially appointed senior representatives from each member nation. The mission of AGARD is carried out through the Panels which are composed of experts appointed by the National Delegates, the Consultant and Exchange Programme and the Aerospace Applications Studies Programme. The results of AGARD work are reported to the member nations and the NATO Authorities through the AGARD series of publications of which this is one.

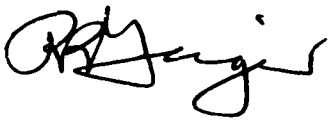
Participation in AGARD activities is by invitation only and is normally limited to citizens of the NATO nations.

Published August 1984

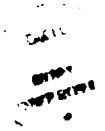
Set and printed by Specialised Printing Services Limited
40 Chigwell Lane, Loughton, Essex IG10 3TZ

PREFACE

This Bulletin presents the 1985 programme approved by the AGARD National Delegates Board. Section I includes a chronological listing of the meetings tentatively scheduled to take place during 1985 and Section II gives a detailed description of the individual Panel Programmes, the Consultant and Exchange Programme, and the Military Committee Studies Programme. The total budget required to support the Proposed 1985 AGARD Technical Programme is presented in Section III. The Publication Summary in Section IV identifies by activity the AGARD publications scheduled for publication in 1985.



Director



A-1

CONTENTS

I – TENTATIVE CALENDAR OF AGARD MEETINGS – 1985

CALENDAR OF MEETINGS 1985

CALENDRIER DES REUNIONS PREVUES EN 1985

Tentative Dates	*Location*	*Panel*	*Type of Meeting Subject*
21—22 March	FRANCE (Paris)	HQ*	58th **National Delegates Board Meeting** 36th **Steering Committee Meeting** (20 March) (NATO Secret) 38th **Panel Chairmen's Meeting** (19—20 March) 15th **National Coordinators' Meeting** *58ème Réunion du Conseil des Délégués Nationaux* *36ème Réunion du Comité d'Orientation (20 Mars) (OTAN Secret)* *38ème Réunion des Présidents de Panel (19—20 Mars)* *15ème Réunion des Coordonnateurs Nationaux*
15—16 April 18—19 April 22—23 April	PORTUGAL FRANCE ITALY	AMP	Lecture Series No.138 **The Impact of Proposed Radio Frequency Radiation Standards on Military Operations** *Cycle de Conférences No.138* *Impact, sur les Opérations Militaires, des Normes Proposées pour les Radiations aux Fréquences Radio*
21—26 April	USA	SMP	60th Panel Meeting/Specialists' Meeting on **(a) Damage Tolerance Concepts for Critical Engine Components** **(b) Aircraft Gear and Bearing Tribology Systems** *60ème Réunion de Panel Réunion de Spécialistes sur* *(a) Conception de la Tolérance à l'Endommagement pour les Composants Critiques de Moteurs* *(b) Systèmes Tribologiques destinés aux Engrenages et Paliers pour Aéronefs*
22—26 April	BELGIUM	FDP	Special Course No.2 on **Cryogenic Technology for Wind Tunnel Testing** *Cours Spécial No.2 sur Technologie Cryogénique dans les Essais en Souffleries*
22—26 April	GREECE	AMP	Mini-Business Meeting/Two Symposia FIRST SYMPOSIUM on **Visual Protection and Enhancement for Aircrew** (NATO Secret) SECOND SYMPOSIUM on **Medical Selection and Physiological Training of Future Flight Aircrew** (NATO Restricted) *Mini-Réunion de Travail/Deux Symposiums* *PREMIER SYMPOSIUM sur Protection et Amélioration de la Vision du Personnel Navigant (OTAN Secret)* *DEUXIEME SYMPOSIUM sur Sélection Médicale et Entrainement Physiologique des Futures Equipages de Chasse (OTAN Diffusion Restreinte)*
2—3 May 6—7 May 21—22 May	GERMANY ITALY USA	FMP	Lecture Series No.139 **Helicopter Aeromechanics** *Cycle de Conférences No.139* *Aéromécanique des Hélicoptères*

* The full Panel titles are listed at the end of this Calendar.
* *La liste des appellations complètes des Panels figure à la fin de ce Calendrier*

Tentative Dates	*Location*	*Panel*	*Type of Meeting/Subject*
6—10 May	GERMANY	FMP FDP	66th Panel Meeting/Joint Symposium with FDP 56th Panel Meeting/Joint Symposium with FMP **Unsteady Aerodynamics — Fundamentals and Applications to Aircraft Dynamics** (FDP Leading Panel) *66ème Réunion de Panel/Symposium Commun avec le FDP* *56ème Réunion de Panel/Symposium Commun avec le FMP* *L'Aérodynamique Instationnaire — Principes Fondamentaux et Applications à la Dynamique des Aéronefs (FDP Chef de file)*
6—10 May	NORWAY	PEP	65th Panel Meeting/Symposium on **Heat Transfer and Cooling in Gas Turbines** *65ème Réunion de Panel/Symposium sur Transfert Thermique et Refroidissement dans les Turbines à Gaz*
13—24 May	UNITED KINGDOM (Cranfield)	FMP	Special Course **Flight Test Instrumentation Course** *Cours Spécial* *Cours sur l'Instrumentation des Essais en Vol*
20—24 May	BELGIUM (VKI)*	FDP	Special Course No.1 on **Aircraft Drag Prediction and Reduction** *Cours Spécial No.1 sur Prévision et Réduction de la Traînée des Aéronefs*
20—24 May	PORTUGAL	AVP	49th Panel Meeting/Symposium on **The Impact of Very High Performance Integrated Circuits on Radar, Guidance and Avionic Systems** *49ème Réunion de Panel/Symposium sur l'Impact des Circuits Intégrés à très haut Degré de Performance sur les Systèmes de Radar, de Guidage et d'Avionique*
20—24 May	NETHERLANDS (The Hague)	GCP	40th Panel Meeting/Symposium on **Guidance, Control, Navigation Automation for Night All Weather Tactical Operations** (NATO Secret) *40ème Réunion de Panel/Symposium sur Navigation, Automatisation, Guidage et Pilotage pour les Opérations Tactiques Nocturnes Tout Temps (OTAN Secret)*
27—29 May	GREECE	MCS	28th Meeting of AASC (NATO Secret) *28ème Réunion de l'AASC (OTAN Secret)*
3—7 June	UNITED STATES (Fairbanks, Alaska)	EPP	36th Panel Meeting/Symposium on **Propagation Effects on Military Systems in the High Latitude Region** *36ème Réunion de Panel/Symposium sur Les Effets de la Propagation sur les Systèmes Militaires aux Latitudes Elevées*
6—7 June	ITALY	PEP	Lecture Series No.140 **3-D Computation Techniques Applied to Internal Flows in Propulsion Systems** *Cycle de Conférences No.140* *Applications des Techniques de Calcul Tri-dimensionnel aux Ecoulements Internes dans les Systèmes Propulsifs*
10—11 June	GERMANY		
13—14 June	FRANCE		
17—18 June	TURKEY	SMP	Lecture Series No.141 **Management of Corrosion** *Cycle de Conférences No.141* *Traitement des Problèmes de Corrosion*
20—21 June	UNITED KINGDOM		
2—3 July	CANADA		
2—6 September	UNITED KINGDOM (Cheltenham)	TIP	38th Panel Meeting/Specialists' Meeting **Managing and Sharing Information Resources for Aerospace, Defence and other R & D Programmes** *38ème Réunion de Panel/Réunion de Spécialistes sur Gestion et Partage des Ressources Informatives pour les Programmes de Recherche et de Développement dans les Domaines de la Défense de l'Aéronautique et de l'Espace*

* Will also be given in the USA as a Short Course in June at NASA Langley

Tentative Dates	*Location*	*Panel*	*Type of Meeting Subject*
8—13 September	GERMANY	SMP	61st Panel Meeting Specialists' Meetings on **(a) Mechanical Qualification of Large Flexible Spacecraft Structures** **(b) Advanced Joining of Aerospace Materials** *61ème Réunion de Panel Réunion de Spécialistes sur* *(a) Détermination des Qualités Mécaniques de Grandes Structures Souples pour Vaisseaux Spatiaux* *(b) Techniques Avancées d'Assemblage pour Matériaux Aérospatiaux*
9—12 September	TURKEY	EPP	37th Panel Meeting/Symposium on **Guided Optical Structures in the Military Environment** *37ème Réunion de Panel Symposium sur l'Optique Guidée dans l'Environnement Militaire*
9—13 September	ITALY	PEP	66th Panel Meeting/Specialists' Meetings on **(a) Smokeless Propellants** **(b) Interior Ballistics of Guns** (NATO Confidential) *66ème Réunion de Panel Réunion de Spécialistes sur:* *(a) les Propergols Non-générateurs de Fumée* *(b) la Balistique Interne des Canons (OTAN Confidentiel)*
18—20 September	BELGIUM (Brussels)	HQ	21st **Annual Meeting** 59th **National Delegates Board Meeting** 37th **Steering Committee Meeting** (17 September) (NATO Secret) 29th **Panel Chairmen Meeting** (16—17 September) *21ème Réunion Annuelle* *59ème Réunion du Conseil des Délégués Nationaux* *37ème Réunion du Comité d'Orientation (17 Septembre) (OTAN Secret)* *39ème Réunion des Présidents de Panel (16—17 Septembre)*
26—27 September	NORWAY	AVP	Lecture Series No.142 **Artificial Intelligence and Robotics** *Cycle de Conférence No.142* *Intelligence Artificielle et Robotique*
30 September — 1 October	NETHERLANDS		
3—4 October	PORTUGAL		
30 September — 4 October	UNITED KINGDOM	FMP	67th Panel Meeting/Symposium on **Flight Simulation** *67ème Réunion de Panel/Symposium sur la Simulation du Vol*
1—2 October	UNITED STATES	GCP	Lecture Series No.143 **Fault Tolerant Software/Hardware Architecture for Flight Critical Functions** *Cycle de Conferences No.143* *Architecture de Logiciel et de Matériel Présentant une Tolérance aux Erreurs, pour Fonctions de Vol Critiques*
17—18 October	DENMARK		
21—22 October	GREECE		
7—10 October	ITALY	AMP	42nd Panel Meeting/Symposium on **Backache and Back Discomfort** *42ème Réunion de Panel/Symposium sur Douleurs et Inconfort du Dos*
7—11 October	FRANCE (Toulouse)	AVP	50th Panel Meeting/Symposium on **Multifunction Radar for Airborne Applications** (NATO Secret) *50ème Réunion de Panel/Symposium sur le Radar Multifonctions pour Applications Aéroportées (OTAN Secret)*

Tentative Dates	*Location*	*Panel*	*Type of Meeting Subject*
7—11 October	GREECE	FDP	57th Panel Meeting/Symposium on **Store/Airframe Aerodynamics** *57ème Réunion de Panel/Symposium sur l'Aérodynamique des Charges Externes*
7—11 October	CANADA	GCP	41st Panel Meeting/Symposium on **Guidance, Control, and Positioning of Future Precision Guided Stand-Off Weapons Systems** *41ème Réunion de Panel/Symposium sur le Guidage, le Pilotage et le Positionnement des Futurs Systèmes d'Armes de Précision, à Distance*
11—13 November	UNITED STATES	MCS	29th Meeting of the AASC (NATO Secret) *29ème Réunion de l'AASC (OTAN Secret)*

Full Panel Titles

AMP — Aerospace Medical Panel
Panel de Médecine Aérospatiale

AVP — Avionics Panel
Panel d'Avionique

EPP — Electromagnetic Wave Propagation Panel
Panel sur la Propagation des Ondes Electromagnétiques

FMP — Flight Mechanics Panel
Panel de la Mécanique du Vol

FDP — Fluid Dynamic Panel
Panel de la Dynamique des Fluides

GCP — Guidance and Control Panel
Panel de Guidage et Pilotage

PEP — Propulsion and Energetics Panel
Panel de Propulsion et d'Energétique

SMP — Structures and Materials Panel
Panel des Structures et des Matériaux

TIP — Technical Information Panel
Panel de l'Information Technique

MSC — Military Committee Studies (Division)
Etudes pour le Comité Militaire (Division)

HQ — Headquarters
Etat-Major

II – PROGRAMME DESCRIPTIONS

PANELS

CONSULTANT & EXCHANGE PROGRAMME

– INDIVIDUAL CONSULTANTS
– LECTURE SERIES

MILITARY COMMITTEE STUDIES

HEADQUARTERS

AEROSPACE MEDICAL PANEL

Chairman: Air Commodore P.HOWARD, UK
Deputy Chairman: Air Commodore G.K.M.MAAT, Netherlands
Executive: Major L.B.CROWELL, Canada

PROGRAMME

In 1985, the Aerospace Medical Panel will conduct three Symposia, a Lecture Series, and Working Group activities.

The Spring meeting will consist of a Mini-Business Meeting and two Symposia for a total of five days. Symposium A will deal with "Visual Protection and Enhancement" (NATO Secret) while Symposium B will look at the "Medical Selection and Physiological Training of Future Fighter Aircrew" (NATO Restricted).

Vision continues to be the pre-eminent sensory channel through which the aviator obtains information necessary for his control of the aircraft and the execution of his operational role. Modern avionic systems can improve the display of information and reduce pilot workload, but their efficacy is dependent upon a number of factors, i.e. layout, use of colour, symbology, luminance and contrast, which merit precise investigation. Likewise, the increasing use of devices such as Night Vision Goggles (NVGs), Forward Looking Infra-red (FLIR) and Helmet-mounted Displays (HMDs), while enhancing operational capability, impose new demands and constraints both on aircrew and their personal equipment.

These changes in display technology may require new visual standards which need to be defined and related to the duties of the various categories of flying personnel, and the relevance of current ocular examination procedures should also be reviewed. In addition, the acceptability of intra and extra ocular lenses (including contact lenses) for flying personnel should be assessed.

Protection of the eyes against damage by impact and non-ionising radiation is of importance for the maintenance of operational efficiency and available techniques could profitably be discussed.

Symposium A will thus embrace the interests of specialists in human factors, psychophysics, visual physiology, clinical ophthalmology, occupational medicine, as well as operational aircrew. High-performance fighter aircraft recently introduced into service and under development, together with the increasing emphasis on the requirement to maintain air operations in the presence of chemical and biological warfare (CBW) agents, require a high standard of performance from the aircrew in the face of increasing environmental stresses. Thus, new combat aircraft such as the F-16 and Mirage 2000 expose aircrew to high levels of sustained $+G_z$ acceleration with very high onset rates and aircraft under development may well subject aircrew to $\pm G_x$ acceleration. These aircraft will also employ novel display systems such as helmet mounted displays and their controls will differ markedly from those of conventional combat aircraft. Protection against CBW agents involves the wearing of equipment which adds mass, reduces mobility and increases discomfort and thermal stress.

The advent of aircraft which impose these more intense and novel aviation stresses together with the use of CBW defence equipment raises questions as to the medical fitness and physiological training required of the aircrew who are to operate them. Much can be learned in these areas from the experiences of the NATO Air Forces in the operation of aircraft such as the F-16 and Mirage 2000 and of the stresses which they impose. Some NATO Air Forces now have several years training experience in the use of CBW defence equipment. Certain NATO Air Forces have been faced with the need to improve the training which their aircrew receive in procedures designed to enhance tolerance to sustained $+G_z$ accelerations and in the detection and avoidance of disorientation.

Symposium B will thus address the medical selection and physiological training of aircrew who are to operate these new high-performance fighter aircraft.

The Fall meeting will consist of the 42nd Business Meeting and a one and one-half day Specialists' Meeting on "Backache and Back Discomfort".

Backache and back discomfort continue to be serious economic and operational problems in both the military and civilian populations in industrial societies, with incidences as high as 80% having been reported. Authorities in the field within NATO are well aware of the complexity of the backache/back-discomfort problem and the difficulty of assessing and alleviating the discomfort. The development of solutions to these problems may also be complex, requiring the expertise of scientists in a variety of disciplines. Several recent advances that bear on the general problem of back pain have been made and this meeting will provide an opportunity for addressing these developments.

There is now an increased understanding of "idiopathic low-back pain" and its epidemiology in the general population. It is a principal cause of employee disability in the civilian world, and there is a major effort to reduce its frequency and the associated costs. There is also an increasing awareness of the relatively high frequency of low-back pain among truck drivers, heavy equipment operators, and others exposed to vehicular vibration. This meeting will thus address the knowledge gained

from the study of back pain in the general population as this should assist those studying similar problems encountered by military agencies.

Within aerospace vehicular environments, the backache/back-discomfort problem in helicopters continues to receive wide attention. Those actively involved with the subject relate the backache/back-discomfort problem to the posture of the operator and the vibration of the helicopter, as well as the stress of operating a difficult aircraft under demanding conditions. Recent developments in advanced cockpit designs with computer-assisted controls and other changes promise to make helicopters easier and less stressful to fly. Human factors and bioengineering efforts are currently focused on seat designs, vibration-attentuating cushions and seats, improved back supports, and other corrective measures, in an attempt to improve aircrew comfort. This meeting will thus address backache and back discomfort in helicopter aircrew from the point of view of its causes, frequency, treatment, prevention, and cost.

Lecture Series 138, sponsored by the AMP, will deal with the subject of the "Impact of Proposed Radio Frequency Radiation Standards on Military Operations" and will be held in France, Portugal and Italy.

Working Group 11 (Clinical and Biomedical Evaluation of Trauma and Fatalities Associated with Aircrew Ejection and Crash) will have completed its work in September 1984 with a published Report. This Group intends to continue in an informal capacity as a four-nation data collection team beyond this date in order to up-date its data base. A new Working Group will form in the Spring to look at the subject of "Sensory Cues Employed in Aircraft Control". A second Working Group may also form at this time to study the data and methods needed in establishing physical (visual) standards required for aircrew using Night Vision Goggles (NVGs).

MEETINGS

Mini-Business Meeting Symposia	— **Visual Protection and Enhancement** (NATO Secret)	22—24 April 1985 Greece
	— **Medical Selection and Physiological Training of Future Fighter Aircrew** (NATO Restricted)	24—26 April 1985 Greece
42nd Panel Meeting Specialists' Meeting	— **Backache and Back Discomfort**	7—10 October 1985 Italy

PUBLICATIONS

Subject	*Projected Publication Date*
Results of Space Experiments in Physiology and Medicine Conference Proceedings	January 1985
Aircrew Helmets — A Historical Compilation of the Design, Development, Specifications and Protective Performance Aspects AGARDograph	March 1985
Visual Functions in High Altitude and Space AGARDograph	March 1985
Advanced Oxygen Systems for Aircraft AGARDograph	June 1985
Visual Protection and Enhancement Conference Proceedings (NATO Secret)	August 1985
Medical Selection and Physiological Training of Future Fighter Aircrew Conference Proceedings (NATO Restricted)	August 1985
Backache and Back Discomfort Conference Proceedings	1986

AVIONICS PANEL

Chairman: Dr F.I.DIAMOND, US
Deputy Chairman: Dr G.H.HUNT, UK
Executive: Lt Col T.B.RUSSELL, US

PROGRAMME

In 1985 the Avionics Panel will sponsor two Symposia, a Lecture Series, and a new Working Group. In addition, the Avionics Panel, tentatively, will serve as the lead Panel for a Multipanel Technology Study and support new and existing Programmes of Support to Greece, Turkey and Portugal.

The Spring Symposium on "The Impact of Very High Performance Integrated Circuits on Radar, Guidance and Avionic Systems" will review the current status of high-performance and high-speed integrated circuit technology together with the techniques which will benefit from the technology and will examine the impact that they will have on military electronic systems.

Advances with silicon integrated circuit technology have demonstrated the feasibility of very large scale integration with gate densitites of 10^5 cm^{-2} and with functional throughput rates in excess of 10^{15} gate Hz cm^{-2}. These advances offer the prospect of compact, low power consumption, high throughput processors for application in a wide variety of roles throughout military electronic systems. They should allow the reduction in size and power consumption of current processors and allow the practical realisation of highly sophisticated processing concepts in radar systems, infrared sensor systems, communication systems, avionics systems and weapon systems. These prospects have precipitated a drive to design microcircuits for signal processing applications and to identify key processing architectures.

The emphasis of the Symposium will be on silicon integrated circuit technology, with account being taken of the current status of gallium arsenide integrated circuit technology, and it will focus on chip organisation, circuit design, architectures and the implementation of advanced processing techniques with very large scale integration. Applications with radar, infrared systems, ESM, communications, navigation systems, avionics and weapon systems are to be addressed.

The Symposium aims to involve integrated circuit experts who will review their current and projected capabilities, circuit and sub-system designers who are exploiting the technology in implementing sophisticated processing and data manipulation techniques and who will report on their progress, and system designers who will describe applications addressed by the advancing technology.

The following sessions are included: Integrated circuit technologies, Chip organization and circuit design, Functional elements, architectures and subsystems, Distributed processors, and System applications.

The Fall Symposium on "Multifunction Radar for Airborne Applications" (NATO Secret) will emphasize concepts of new radar systems rather than the detailed design of radars. The Guidance and Control Panel will support this Symposium.

Radar is still the most important sensor in military aircraft. A number of important features make radar superior to optical systems and other sensors.

These include:

- long-range performance
- penetration of weather (fog, clouds)
- range and doppler estimation
- flexibility due to electronic beam steering
- various signal processing routines
- high-resolution imaging (SAR)

Different tasks such as target search, tracking, and missile guidance can be fulfilled by radar. In a military aircraft, additional tasks such as terrain-following and avoidance, mapping, doppler navigation, and SAR imaging may be required. Since most of the output data is combined in a single on-board computer, the question arises as to which radar functions should be integrated and at what level. Reduction of size, weight, cost, and power consumption are particular goals for commonality in airborne radar systems.

However, integration of several radar tasks in one system may cause problems for the achievement of reliable overall performance. Centralized systems may be more efficient because of the integration of different functions at the same radar level, but they may be subject to catastrophic failure if proper attention is not given to design for fault tolerance and overall system reliability. Careful attention must also be given to mode timeliness and duty circles in order that all functions can be accomplished within the operating speed and capacity of the integrated system.

In the past decade, a number of new technologies have emerged and will have decisive influence on tomorrow's radar concepts. VLSI and VHSIC will open new dimensions of digital signal processing. New analogue techniques, such as SAW devices and optical methods, promise new ways of analogue signal processing. Systolic processor structures can reduce operation time. On the other hand, new antenna concepts (in particular active and conformal arrays) and algorithms offer new dimensions in the performance of airborne radars such as 360 degree coverage, jammer and clutter resistance, high resolution, target tracking and multi-purpose operation.

Sessions will cover: Airborne radar systems, Issues in integration of radar functions, Radar technology and techniques, and Simulation of multifunction radar.

Lecture Series 142 on "Robotics and Artificial Intelligence" covers a topic that is becoming more important and has evoked major interest in many NATO countries.

Working Group 12 "Integration of Avionic Imaging Sensor Signals for Tactical Aircraft", will commence work in 1985. In current tactical aircraft the pilot's navigation and target acquisition task is aided by the independent display of externally sensed imagery and on-board mission-related information. The aim of the Working Group is to identify techniques to enhance the abilities of the pilot by processing, mixing and presenting the available information in an integrated format, optimally suited to the pilot's cognitive perception.

To accomplish this, Working Group 12 will

- assess the characteristics of aircraft imagery signals and the available techniques for conversion to a common format,
- analyse the required processing methods to extract desired features in the independent images,
- compile the desired characteristics of the displayed information in relation to the pilot's mission,
- predict the added value obtained by the integrated display of the available information,
- compile existing (and suggest new) concepts for the processing and display of such information,
- identify areas for further research in image processing and the required technologies for its realization,
- identify common areas.

Subject to final approval being received at the Fall 1984 National Delegates Board Meeting, the Avionics Panel will serve as the lead Panel for a Multipanel Technology Study on "The Potential Impact of Avionics Electronic Technology (and Other Electronic Technology) on the Future Conduct of Air Warfare".

The Study will identify and quantify the benefits of the continuing rapid development of integrated circuit technology and will examine their potential impact on the future conduct of air warfare and other aeronautical technologies. The aim would be to stimulate military and scientific thought towards radical solutions to the conduct of air warfare which would give NATO the continued capability to survive aggression at an affordable cost.

The Technology Study will be in the format of a Workshop. A diversified group of technological, application, and operational experts will participate. During the opening session the objectives of the Workshop, operational requirements, threat, trends in air warfare and anticipated advances in electronic and information sciences will be briefed during a period of mutual education. The Workshop will then breakdown into Panel discussion groups. Using brainstorming techniques, properly organized, planned, and limited, the areas for technology applications will be identified. Panel Leaders will then provide oral reports to the entire Workshop. Systems engineering and integration discussions will then take place.

The end product of the Workshop will be a report that includes the transactions and briefings of the Workshop, conclusions, and recommendations. The recommendations will include areas for further studies and suggestions for future AGARD working groups, Symposia, Specialists' Meetings, AGARDographs, and Aerospace Applications Studies, or for NATO collaborative research.

MEETINGS

49th Panel Meeting Symposium	— **The Impact of Very High Performance Integrated Circuits on Radar, Guidance and Avionics Systems**	20—24 May 1985 Portugal
50th Panel Meeting Symposium	— **Multifunction Radar for Airborne Applications**	7—11 October 1985 France

PUBLICATIONS

Subject	*Proposed Publication Date*
Digital Optical Circuit Technology Conference Proceedings	February 1985
The Impact of Very-High-Performance Integrated Circuits on Radar, Guidance and Avionic Systems Conference Preprints	March 1985
The Impact of Very-High-Performance Integrated Circuits on Radar, Guidance and Avionic Systems Conference Proceedings	August 1985
The Impact of Very-High-Performance Integrated Circuits on Radar, Guidance and Avionic Systems Technical Evaluation Report	August 1985
Multifunction Radar for Airborne Applications Conference Preprints	September 1985

ELECTROMAGNETIC WAVE PROPAGATION PANEL

Chairman: Dr J.H.BLYTHE, UK
Deputy Chairman: Dr H.SOICHER, US
Executive: Lt Col T.B.RUSSELL, US

PROGRAMME

In 1985 the Electromagnetic Wave Propagation Panel will sponsor a Symposium and a Specialists' Meeting.

The Spring Symposium will examine "The Propagation Effects on Military Systems in the High Latitude Region".

With the advent of new systems operating at high latitudes in the field of detection, navigation and communications and with the new experiments at high latitudes ranging from incoherent scatter studies to satellites for studying high latitude irregularity structures, it is of considerable importance to relate the advances in high latitude studies to military systems. The concept of this proposal for a meeting in propagation effects on military systems in the high latitude region is to bring together these two areas.

The behaviour of the propagation environment at high latitudes differs from that at lower latitudes, affecting radiowave propagation across the RF spectrum. The differences are ascribed to rugged terrain, severe climatic conditions, and the influences of the interplanetary and magnetospheric geophysics events which are guided earthward by the geomagnetic field.

The high-latitude ground region is characterized by a rugged terrain and by a tremendous variation in ground electrical characteristics.

The severe climatic conditions include a large daily and seasonal temperature variation, extremes of temperatures, high winds, ice accumulation, precipitation (rain, snow, ice crystals, sleet, hail), surface and elevated temperature inversions which produce large refractive gradients and ducts.

The high-latitude ionosphere is affected by two major phenomena: energetic particles from the sun and from the outer magnetosphere penetrate the atmosphere and create ionization at various altitudes; and the solar wind induces an electric field perpendicular to the magnetic field which causes ionization drifts and thus contributes to the formation of ionization irregularities. Some of the ionospheric propagation anomalies created include: auroral oval absorption and polar cap absorption; sporadic E, small scale irregularities (Spread F) giving rise to scattering and fading phenomena and causing transionospheric amplitude and phase scintillations; effects of magnetic substorm activity, density troughs, and large sheets of field-aligned ionization.

The Symposium will direct its efforts towards propagation problems and solutions for many systems. These topics include satellite communication over polar and auroral latitudes, Over-the-Horizon Radar, Low-Frequency propagation under high-latitude conditions, remote sensing of high-latitude regions by active and passive EM systems and HF communications at auroral and polar latitudes. Unique lower atmospheric effects and multipath problems of importance at high latitudes will also be discussed. The Avionics Panel will provide support for this Symposium.

With the NATO Northern Flank nations (in both the European and North-American sectors) situated in the high-latitude region, with NATO air routes across the Atlantic traversing that region, and with surveillance and early-warning systems looking in the direction of the region, the propagation characteristics of the high-latitude region are of critical importance to the mission of the alliance in the areas of communications, navigation and surveillance.

The Fall Specialists' Meeting on "Guided Optical Structures in the Military Environment" will address a new technology that has arisen since the 1977 AGARD Meeting dealing with related topics: single mode structures in the form of optical fibres and planar waveguides operating at long wave lengths, 1.3 microns and beyond, with minimum attenuation and dispersion. Fibres with attenuation below 0.5 dB/km and bandwidths in the hundreds of GHz-km have opened up the possibilities for long distance, repeaterless transmission on land and under water. In addition, the single-mode structure has bred a new class of passive devices; sensors capable of detecting sound, magnetic field, motion, temperature, humidity and many other characteristics, all of them approaching the theoretical detection limit. Planar waveguides built out of dimensions less than one micron, capable of confining light and creating high-power densities with a few applied volts are responsible for new active components: single-mode high efficiency, long-life laser chips operating at room temperature, electro-optic switches, and components capable of generating new frequencies through Raman scattering and other non linear phenomena.

This new technology is responsible for far-reaching military applications of tactical and strategic importance in the areas of rapidly deployable tactical communications, undersea surveillance systems, and interferometric and evanescent coupling sensors, in particular, fibreoptic gyroscopes, magnetometers, and hydrophones.

Supported by the Avionics Panel, the Electromagnetic Wave Propagation Panel will bring together the experts from the military, academia and industry to combine and unify the technology and the military applications into a coherent Specialists' Meeting

MEETINGS

36th Panel Meeting Symposium	— **Propagation Effects on Military Systems in the High-Latitude Region**	3—7 June 1985 USA
37th Panel Meeting Specialists' Meeting	— **Guided Optical Structures in the Military Environment**	9—12 September 1985 Turkey

PUBLICATIONS

Subject	*Proposed Publication Date*
Target Signatures Conference Proceedings (NATO Secret)	February 1985
Target Signatures Technical Evaluation Report	February 1985
Propagation Effects on Military Systems in the High-Latitude Region Conference Preprints	May 1985
Guided Optical Structures in the Military Environment Conference Preprints	August 1985
Propagation Effects on Military Systems in the High-Latitude Region Conference Proceedings	September 1985

FLIGHT MECHANICS PANEL

Chairman: Dr S.R.M.SINCLAIR, Canada
Deputy Chairman: Dr P.HAMEL, Germany
Executive: Mr H.TORODE, UK

PROGRAMME

For 1985 the Flight Mechanics Panel will join with the Fluid Dynamics Panel in holding a joint Symposium, will hold one Panel Symposium and will support two Working Groups. The AGARDograph programme, sponsored primarily by Working Group 11 (Flight Test Techniques) will continue.

The joint Symposium will be on "Unsteady Aerodynamics — Fundamentals and Application to Aircraft Dynamics", with the Fluid Dynamics Panel leading. The two Panels have joint concern with the unsteady aerodynamic forces induced by separated flow, an area which has become increasingly important with the use of wings utilising upper-surface vortices generated by leading-edge separation, and through a common Programme Committee they will share in establishing the symposium programme. The FMP's primary interest is with the behaviour of the complete flight vehicle, this including its interaction with basic, fluid dynamic, mechanisms of unsteady force generation. It will seek inputs to the symposium covering advanced mathematical modelling including non-linearities, time-dependent effects, cross coupling, hysteresis, coning; prediction of wing-rock, nose-slice etc; departure, spin entry and recovery; sensitivity studies with respect to various parameters; implications for active control systems and simulation.

The Fall Symposium will be on "Flight Simulation", a topic last addressed by an FMP symposium in 1978; since then important advances have been made in simulator technology, and in its appreciation and application. The Symposium will be concerned primarily, but not exclusively, with ground-based simulation, and will comprise two main sectors addressing firstly the engineering and technology aspects (motion systems, visual systems, cockpit systems, computer systems) and secondly the uses and applications of simulators, in training, in research, in development and projects. A brief section of the meeting will address the use of in-flight simulation. AMP and AVP will contribute papers.

Both symposia will be unclassified.

In conjunction with the Consultant and Exchange Programme, the Panel will support a further Special Course on Flight Test Instrumentation, to be held at the Cranfield Institute of Technology, UK. The Panel has agreed that it is appropriate to hold this Course at intervals of two years. It will cover the theory and practical application of instrumentation techniques and will include practical work in a laboratory aircraft.

The Panel will sponsor a Lecture Series on "Helicopter Aeromechanics", giving an overview with latest technological developments and influence on operation of military helicopters.

Working Group 11 (Flight Test Techniques) will continue its work and will publish one AGARDograph. Six AGARDographs will be in preparation during the year.

Working Group 14 (Rotorcraft Icing) will hold its final meeting in Spring 1985 and an Advisory Report will be published.

MEETINGS

66th Panel Meeting and Joint Symposium with FDP	— **Unsteady Aerodynamics — Fundamentals and Applications to Aircraft Dynamics**	6—10 May 1985 Germany
67th Panel Meeting Symposium	— **Flight Simulation**	30 Sept — 4 October United Kingdom

PUBLICATIONS

Subject	*Proposed Publication Date*
Active Control Systems Conference Proceedings	March 1985

Subject	*Proposed Publication Date*
Active Control Systems Technical Evaluation Report	March 1985
Dynamic System Parameter Identification (A volume of AGARDograph 300) **Part 2 — Application to Aircraft Stability and Control**	May 1985
Unsteady Aerodynamics — Fundamentals and Application to Aircraft Dynamics Conference Proceedings (jointly with FDP)	September 1985
Rotorcraft Icing Advisory Report	September 1985
Determination of Antenna Patterns and Radar Reflection Characteristics of Aircraft (A volume of AGARDograph 300)	September 1985
Measurement of Pilot Workload AGARDograph	October 1985
Simulator Motion System Characteristics and Perceptual Fidelity AGARDograph	October 1985

FLUID DYNAMICS PANEL

Chairman: Dr L.ROBERTS, US
Deputy Chairman: Dipl. Ing. P.W.SACHER, Germany
Executive: Mr R.H.ROLLINS II, US

PROGRAMME

In 1985, the Fluid Dynamics Panel proposes two Symposia, one of them supported jointly by the Flight Mechanics Panel. Sponsorship of two Special Courses and several publications are also planned.

The Spring Symposium on "Unsteady Aerodynamics — Fundamentals and Applications to Aircraft Dynamics" will be led by the Fluid Dynamics Panel which has its primary interest in the more basic aspects of this field, including unsteady boundary layers, instabilities in transonic flow, oscillating and unsteady vortical flows, separation-caused pressure fluctuations and unsteady loads and separation phenomena. The FDP will also take the lead in sessions covering experimental and analytical techniques for the determination of dynamic stability parameters, while the Flight Mechanics Panel will be responsible for presentations and discussion from the standpoint of the complete flight vehicle and its dynamics, including control systems and flight simulators. The Programme Committee includes members of both panels. Aspects of unsteady flows of interest to the Structures and Materials Panel have been considered and that panel has also been invited to present papers, one of which will be an overview of the 1984 SMP meeting on the effects of unsteady flow on the AGARD standard configurations.

The Fall Symposium on "Store-Airframe Aerodynamics" will cover the aerodynamic consequences of the carriage and release of external stores, including drag, installed airloads, local buffeting, lift and stability effects, release trajectory and associated measurement and prediction techniques. This topic, of great interest because of the diversity of store configurations and their strong influence on performance and manoeuvrability of military aircraft, follows a FDP Working Group of 1975—77. The Flight Mechanics Panel will contribute one or more papers to the meeting and contributions are also expected from the Structures and Materials Panel.

The two five-day Special Courses planned by the Panel are on the topics: "Cryogenic Technology for Wind Tunnel Testing" and "Aircraft Drag Prediction and Reduction" and are, as is the Fluid Dynamics Panel practice, to be conducted under the joint sponsorship of the von Kármán Institute and AGARD. The second course has also been recommended for presentation in the United States.

The final report of Working Group 08 on "Aerodynamics of Aircraft Afterbody" will be completed by the end of 1984 and will include a survey of the latest experimental techniques for wind tunnel testing of the aft section of aircraft and a comparison and evaluation of computational methods used for design evaluation.

Working Group 09 on "Boundary Layer Control and Simulation in Wind Tunnels", which has been planned for a mid-1984 start, will be well under way in 1985 in its efforts to analyse techniques currently in use and suggest improved methods which will provide better correlation of wind tunnel test results.

The FDP will contribute to three activities planned by the Propulsion and Energetics Panel for 1985: a meeting on interior ballistics; a Lecture Series on computational techniques; and a Working Group on flow computation.

A number of other topics proposed for years beyond 1985 by other Panels, usually FMP, PEP, and SMP, are being coordinated for possible involvement or contribution by the FDP.

The Panel is in the process of defining several new projects in collaboration with Turkey and hopes to initiate this work late in 1984 or early 1985. Four projects involving Greece, France, Germany, the United Kingdom and United States and two involving Portugal and several nations will be completed before the end of 1985.

MEETINGS

56th Panel Meeting and Joint Symposium with FMP	— **Unsteady Aerodynamics — Fundamentals and Application to Aircraft Dynamics**	6—10 May 1985 Germany
57th Panel Meeting Symposium	— **Store/Airframe Aerodynamics**	7—11 October 1985 Greece

PUBLICATIONS

Subject	*Projected Publication Date*
Aerodynamics of Aircraft Afterbody WG 08 Advisory Report	January 1985
Cryogenic Technology for Wind Tunnel Testing Special Course Notes	March 1985
Unsteady Aerodynamics — Fundamentals and Application to Aircraft Dynamics Conference Preprints	April 1985
Computation of Steady and Unsteady Fluid Dynamics AGARDograph	June 1985
Aircraft Drag Prediction and Reductions Special Course Notes	May 1985
Store-Airframe Aerodynamics Conference Preprints	September 1985
Unsteady Aerodynamics — Fundamentals and Application to Aircraft Dynamics Technical Evaluation Report	October 1985
Complex Turbulent Flows AGARDograph	November 1985
Store-Airframe Aerodynamics Conference Proceedings	December 1985
Store-Airframe Aerodynamics Technical Evaluation Report	1986
Flow Visualization Techniques and Interpretation AGARDograph	1986
Reynolds Number Effects in Transonic Flow AGARDograph	1986

GUIDANCE AND CONTROL PANEL

Chairman: Dr Ing. R.C.ONKEN, Germany
Deputy Chairman: Mr K.A.PEEBLES, Canada
Executive: Mr B.M.HELIOT

PROGRAMME

The GCP Programme for 1985 consists mainly of two symposia and one AGARDograph. In addition, the Panel will sponsor one Lecture Series and continue the activities of two working groups.

The Spring Symposium will cover "Guidance – Control – Navigation Automation for Night All-Weather Tactical Operations".

The need to achieve night all-weather operation of tactical air forces in the face of increasing lethal threats is becoming critical and suggests a requirement for increased automation in order to reduce pilot workload and improve performance under such adverse operational conditions.

An approach to this problem is a core structure around which further automation could be developed as required, including aided flight path control, through generation and display of optional trajectories, generation of imagery for synthetic visibility and display of both expected and unexpected threats. The techniques described in recent symposia will permit many different approaches to the configuration and design of such an integrated and automated core structure.

The purpose of the symposium is to explore the design characteristics and trade-offs involved in the components functions and systems integration required to support the development and evolution of alternative core structures which are capable of enabling effective and routine all-weather operations.

The proposed topics have been coordinated with AVP and AASC and the meeting is expected to be classified.

The Fall symposium will deal with "Guidance, Control, and Positioning of Future Precision-Guided Stand-off Weapon Systems".

This symposium is considered to be a continuation of the Guidance and Control Panel 34th Symposium on PGM's and will cover the following topics:

- Unmanned versus manned systems:
  improvement of effectiveness, affordability of unmanned systems for special tasks as compared to manned aircraft with multirole capability.
- Surveillance target, selection and identification, command and control, tactical mission planning and management.
- Guidance, control, positioning, navigation of:
  - RPVs
  - Drones
  - SOMs
  - Cruise missiles

  Commonality and particular differences in respective guidance and control systems, correlation schemes, unlimited TERCOM, map-matching,etc.
- Sensor aspects, multi-mode seekers, target acquisition and tracking, signal processing, jam-resistant data links, ECCM, OCCM.
- Impact of future micro-electronics on guidance and control sensors and systems: standardization aspects such as bus-structured computing systems, high order languages, aircraft/weapon interconnections, etc.

The theme has been coordinated with the AVP and the symposium is expected to be classified.

The Panel will prepare one new AGARDograph on "Computation, Prediction and Control of Aircraft Trajectories". During the last decade, the generation of aircraft trajectories has undergone very considerable revision by reason of developments in data acquisition, processing, filtering and control techniques.

The introduction of 4-D navigation is one example.

It is now an appropriate time to produce a state-of-the-art survey covering, tentatively, three distinct complementary aspects, closely inter-related in practice – namely, computation, prediction and control of aircraft trajectories.

The part devoted to computation will cover the type and availability of basic information, constitution of data banks, methods of integration, and generation of trajectories for a variety of applications.

The prediction part will deal with on-board and ground-based techniques, sources and relative importance of disturbances, and the production of optimum prediction.

Thirdly, the part devoted to control will discuss the conduct of individual planned or programmed flights constrained or not by other traffic, with or without ground-based assistance.

Finally, a brief survey will be made of the facilities available, or in an advanced stage of development, to enhance the three functions discussed, namely computation, prediction and control of aircraft trajectories.

The Panel will also sponsor one Lecture Series on "Fault-Tolerant Software-Hardware Architecture for Flight Critical Functions".

Considerable interest has been expressed in fault-tolerant concepts for flight critical functions that take advantage of theoretical and mathematical advances which can be implemented in next generation computations. The emphasis on low-level night all-weather operation also increases the number of functions that demand flight critical and design attention architectures.

The Panel will not propose any new working group since working groups GCP/WG.07 and GCP/WG.08 will still be in active operation in 1985.

MEETINGS

40th Panel Meeting Symposium	— **Guidance — Control — Navigation Automation for Night All-Weather Tactical Operations** (Classified)	20—24 May 1985 Netherlands
41st Panel Meeting Symposium	— **Guidance, Control, and Positioning of Future Precision-Guided Stand-off Weapon Systems** (Classified)	7—11 October 1985 Canada

PUBLICATIONS

Subject	*Projected Publication Date*
Guidance — Control — Navigation Automation for Night All-Weather Tactical Operations Conference Proceedings and Supplement	July 1985
Guidance — Control — Navigation Automation for Night All-Weather Tactical Operations Technical Evaluation Report	July 1985
Verification and Validation of Guidance and Control Software AGARDograph	October 1985
Guidance, Control, and Positioning of Future Precision-Guided Stand-Off Weapon Systems Conference Proceedings and Supplement	December 1985
Guidance, Control, and Positioning of Future Precision-Guided Stand-Off Weapon Systems Technical Evaluation Report	December 1985
Fault-Tolerant Considerations on Methods for Guidance and Control Systems AGARDograph	December 1985

PROPULSION AND ENERGETICS PANEL

Chairman: Prof. Ch.HIRSCH, Belgium
Deputy Chairman: Prof. H.WITTENBERG, Netherlands
Executive: Dr-Ing. E.RIESTER, Germany

PROGRAMME

In 1985 the Propulsion and Energetics Panel will balance its main interest between selected topics in the field of gas turbine and rocket motors. In the Spring, the Panel will hold a Symposium on "Heat Transfer and Cooling in Gas Turbines". For the Fall 1985 two Specialists' Meetings are planned, the first on "Smokeless Propellants" and the second on "Interior Ballistics of Guns". Both are classified NATO Confidential and are partly addressed to the same audience.

The Panel will continue with Working Group 15 on "Uniform Engine Testing Programme" for testing and for evaluating and reviewing the test results. Working Group 16 on "Supply and Demand Scenarios for Aviation Turbine Fuels" will publish the final report. Working Group 17 on "Performance of Rocket Motors with Metallized Propellants" will complete the review and comparison of specific inputs prediction methods. A new Working Group 18 on "Test Cases for Computation of Internal Flows in Aero Engine Components" will start in 1985.

The Panel will sponsor a Lecture Series on "3-D Computation Techniques Applied to Internal Flows in Propulsion Systems", with FDP support. For the AGARDograph "Manual for Aeroelasticity in Turbomachines" the review of the contributions will be performed in 1985. Two other AGARDographs, one on "Hazard Studies for Solid Propellant Rocket Motors", the other on "Altitude Rocket Test Facility Register", will be started in 1985.

In addition, the Panel will support some of the 1985 activities of another Panel:

- SMP Spring 1985 Meeting, on "Gear and Bearing Tribological Systems". PEP is prepared to provide three or four authors to present papers.
- SMP Spring 1985 Meeting, on "Damage Tolerance Concepts for Critical Engine Components". PEP will provide the two requested papers, one for an overview on a complementary 1984 PEP Meeting, the other solicited from Rolls-Royce.

The purpose of the Symposium on "Heat Transfer and Cooling in Gas Turbines" is to bring together experts in the field of aero engine heat transfer and cooling to discuss new research results and new developments for improved engine performance. For compressors the scope will include: transient thermal behaviour of discs and casings, clearance control, heat generation, modelling, testing and experience. For turbines will be included: cooling of blades, vanes, liners, casings, discs; cooling-airflow interferences, transient behaviour and clearance control; modelling, test methods and test facilities. For combustors, afterburners and exhaust nozzles, the scope will include tube cooling, radiation modelling, effect of alternative fuels, nozzle cooling; prediction methods, testing and experience. Finally, also main heat exchangers and those for subsystems will be included. Excluded will be related problems with rockets and other non-gas turbine propulsion systems as well as icing, seals, bearings, lubrication, electronic boxes, etc. FDP is interested in this Symposium but will not provide support.

Already in the PEP 53rd Symposium on "Solid Rocket Motor Technology" held in Spring 1979, diverging views on smoke and visibility were stated, and a follow-on activity was suggested. In the two-day Specialists' Meeting on "Smokeless Propellants", it is intended to bring together specialized experts in this field to discuss their problems and the definition of smokeless propellants. The scope will include: experimental results and their comparisons on smokelessness, minimum smoke and reduced smoke of propellants; smokeless inhibitors; smoke measurements at static firings, particle collection, different wavelengths; light diffusion and contrasts; plume analysis. The meeting will be classified NATO Confidential. There is no interest of other Panels in this subject.

The subject for a two-and-a-half day Specialists' Meeting, of "Interior Ballistics of Guns", was already proposed in 1981, and selected by the Panel because of the strong interest of several nations (France, Germany, Italy, the Netherlands and US). The subject was intensively coordinated with FDP. This Panel has completed an AGARDograph on "Fluid Dynamic Aspects of Internal Ballistics" (AR-172, 1982) and is prepared for a strong support and for collaborating with the PEP Programme Committee. The scope of the Specialists' Meeting will include all kinds of solid and liquid propellant guns, requirement for tactical applications, characteristics and performance, ignition and charge, combustion instability, experimental results and test techniques, comparison with rockets, future problems. Also included will be thrusters for ejection seats, etc. Excluded will be electromagnetic guns since there are no real internal ballistics. The Meeting will be classified NATO Confidential.

Working Group 15 on "Uniform Engine Testing Programme" will continue the test runs. The resulting data are numerous and their evaluation and drafting of a report is connected with a tremendous workload which can only be performed by a retired expert involved in the Working Group. The Panel has therefore included preparation cost in the budget covering travel to WG meetings and to facilities, honorarium and incidental expenses.

Working Group 16 on "Supply and Demand Scenarios for Aviation Turbine Fuels" will have a final report available which will be published in 1985. The NASA Study report will be attached.

Working Group 17 on "Performance of Rocket Motors with Metallized Propellants" will complete its review and comparison of the different specific impulse prediction methods applied in the nations and will discuss the appropriate test techniques. WG 17 will also survey the preparation of an AGARDograph on Altitude Rocket Test Facility Register.

A new Working Group 18 on "Test Cases for Computation of Internal Flows in Aero Engine Components" will start in 1985. It is a follow-on activity on the successful Working Group 12 on "Through-Flow Calculations in Axial Turbomachines". Increasing development of three-dimensional flow field computation has brought the need for test cases. WG 18 shall identify subjects in the propulsion field for which research and development experts need test cases and find and document reliable test cases including their limits of application. The scope will be confined to axial compressors, axial turbines and ducts ahead of and between these components. The subject was coordinated with FDP which has provided a member for the Group.

Support to Greece, Portugal and Turkey

In 1985, the Panel will be involved in five projects which are already approved. One project is defined, but still needs approval. Several other projects are in preparation or might be proposed later in 1984.

MEETINGS

65th Panel Meeting Symposium	— **Heat Transfer and Cooling in Gas Turbines**	6—10 May 1985 Norway
66th Panel Meeting Specialists' Meeting	— **A — Smokeless Propellants** **B — Interior Ballistics of Guns**	9—13 September 1985 Italy

PUBLICATIONS

Subject	*Projected Publication Date*
Gears and Power Transmission Systems for Helicopters and Turboprops Conference Proceedings	March 1985
Heat Transfer and Cooling in Gas Turbines Conference Preprints	May 1985
Evaluation of Measurement in Flames AGARDograph	May 1985
Smokeless Propellants Conference Preprints	September 1985
Interior Ballistics of Guns Conference Preprints	September 1985
Supply and Demand Scenarios for Aviation Turbine Fuels WG 16 Advisory Report	October 1985
Heat Transfer and Cooling in Gas Turbines Conference Proceedings	October 1985

STRUCTURES AND MATERIALS PANEL

Chairman: Dr W.WALLACE, Canada
Deputy Chairman: Mr W.G.HEATH, UK
Executive: Mr D.A.DRANE, UK

PROGRAMME

In 1985 the Panel plans to hold four Specialists Meetings and two Workshops, support two Working Groups, sponsor a Lecture Series, and publish at least one AGARDograph and number of other reports. It will also continue the supervision of three AGARD SMP-coordinated collaborative research programmes.

The first of the two Spring Specialists' Meetings will examine the problems posed by Aircraft Gear and Bearing Tribology. In particular it will consider how best to inter-relate the various advances being made in the many different fields of relevant technologies where the specialists in one area may not have an opportunity of sharing views with the specialists from another. The intention is to encourage an expansion of correctly directed research so as to bring about shorter development times and reduced costs for aircraft bearings and drive trains.

The second Spring Specialists' Meeting will address the topic of Damage Tolerance Concepts for Critical Engine Components. The introduction of such ideas should bring significant economic benefit through the extension of the safe lives of expensive components. The approach is critically dependent on the non-destructive inspection and evaluation techniques needed for the characterisation of any defects and on the capacity of fracture mechanics techniques to predict defect behaviour. The meeting will discuss the philosophy of the damage tolerance approach and consider the associated requirements and specialist techniques needed for its broader implementation.

The first of the two Fall Specialists' Meetings will consider the Mechanical Qualification of Large Flexible Spacecraft Structures. The cost of qualification of these structures, both for analysis and for testing, has become significant and must be controlled; equally, the technical and cost options of both analysis and test need to be fully understood if they are to be satisfactorily applied. The meeting will evaluate trends in spacecraft design, as they relate to qualification, and report back.

The second of the Fall Specialists' Meetings is to discuss Advanced Joining of Aerospace Metallic Materials. The Panel has considered, on previous occasions, various aspects of the fabrication processes used in Aerospace; however, the Panel has not previously considered joining in isolation, although it represents one of the advanced fabrication processes. The meeting will aim to review the present state-of-the-art, identify outstanding problems relating to novel materials and designs, examine recent research and development in NATO countries that might bear on these problems and consider the economic and other implications of using advanced joining technology for the manufacture and repair of aerospace hardware.

Three AGARD SMP-coordinated research programmes will generate Workshops which are to be held at the same time as the Specialists' Meetings. In the Spring the programme of Research into Short Crack Effects will hold a discussion of the results obtained so far; and in the Fall a similar meeting will be held for those taking part in the Engine Disc Material Test Programme. As these Workshops will relate to programmes in being, the attendance will be limited to those participating in the programmes and invitees. The third Workshop will discuss the results of the FACT (Fatigue in Aircraft Corrosion Testing) programme, the form of the final report, and the direction that future research should take.

The Panel will support two Working Groups. The first of these, SMP WG22, is in the process of defining Aircraft Design Requirements for Operation on Damaged and Repaired Runways. The Group is working in close collaboration with AASC and also with the NATO Senior Logisticians Conference and hopes that its findings, now due in the fall of 1985, will be an input to the future activities of both these bodies.

The second Working Group SMP WG23 is developing a Manual for Advanced Casting; the aim is to produce a publication setting out the basic technology, so that industry can take advantage of the potential for lowered costs offered by these manufacturing techniques.

The Panel is proposing a Lecture Series on the Management and Control of Corrosion. Many NATO operators are extending the lives of their aircraft fleets, and in consequence this topic is of pressing interest.

MEETINGS

60th Panel Meeting Specialists' Meeting	– **Aircraft Gear and Bearing Tribology Systems**	21–26 April 1985 USA
	– **Damage Tolerance Concepts for Critical Engine Components**	

61st Panel Meeting Specialists' Meeting	— **Mechanical Qualification of Large Flexible Spacecraft Structures** — **Advanced Joining of Aerospace Metallic Materials**	8—13 September 1985 Germany

PUBLICATIONS

Subject	*Projected Publication Date*
Handbook on Corrosion, Vol.II AGARDograph	March 1985
Transonic Unsteady Aerodynamics and its Aeroelastic Applications Technical Evaluation Report	March 1985
Aircraft Gear and Bearing Tribological Systems Conference Proceedings	July 1985
Damage Tolerance Concepts for Critical Engine Components Conference Proceedings	July 1985
Mechanical Qualification of Large Flexible Spacecraft Structures Conference Proceedings	December 1985
Advanced Joining of Aerospace Metallic Materials Conference Proceedings	December 1985

TECHNICAL INFORMATION PANEL

Chairman:	Mr G.TITTLBACH, Germany
Deputy Chairman:	Miss N.M.WILDGOOSE, Canada
Executive:	Mr E.T.SHARP

PROGRAMME

The Technical Information Panel will hold one meeting during the year. This will be a combined Panel Business and two-day Specialists' Meeting in Cheltenham, UK. The primary aims of the Specialists' Meeting, which is entitled "Making Full Use of Information Resources in Aerospace, Defence, and other R&D Programmes", are to develop recommendations to AGARD, NATO, and the NATO Nations on the resources which could profitably be directed towards information programmes, based on the return on investment, and to demonstrate that cutting back on information support at times of recession is a short-sighted policy. The underlying hypothesis is that, while there is general recognition that a solid base of knowledge is essential to the development of sound R&D programmes, today the pressures of vast quantities of information, the complexities, and on occasion high cost, of new technologies, and limited budgets force us to consider anew the ways in which we use our knowledge base.

MEETINGS

38th Panel Meeting Specialists' Meeting	— **Making Full Use of Information Resources in Aerospace, Defence, and other R&D Programmes**	United Kingdom

PUBLICATIONS

Subject	*Projected Publication Date*
Making Full Use of Information Resources in Aerospace, Defence, and other R&D Programmes Conference Preprints	July 1985
Guide to Aerospace and Defence Technical Report Series in NATO Countries Report	October 1985
Making Full Use of Information Resources in Aerospace, Defence, and other R&D Programmes Conference Proceedings	December 1985

CONSULTANT AND EXCHANGE PROGRAMME

Chief, Plans and Programmes: Mr C.E.BORGEAUD
Deputy, Plans and Programmes: Colonel G.ALEXIS (FAF)

The Consultant and Exchange Programme was established in order to respond to requests made by the Nations and to complement Panel activities in establishing contacts between aerospace scientists and engineers in areas not always covered by the Panels.

This Programme uses several main methods to carry out its mission: individual consultants, exchange of scientists and Lecture Series.

INDIVIDUAL CONSULTANTS AND EXCHANGE OF SCIENTISTS

Individual consultants are specifically requested by the National Delegates of the nations concerned.

Individual consultants are also made available to support various AGARD activities: Panels or Panel members request individual consultants' expertise, visits and lectures by individuals or by teams of experts (Short or Special Courses) for carrying out part of their programme. Panels, Working Groups and the AASC also make use of individual consultants to support specific projects.

This programme also facilitates arrangements for the exchange of scientists between research establishments or between nations, or an exchange of equipment between laboratories.

In 1985 this programme will support three Special Courses:

— FDP Special Course No.1 on Aircraft Drag Prediction and Reduction

The Course will be held at the von Kármán Institute, in Belgium, on 20—24 May, 1985, and in the USA (NASA Langley) in June 1985.

Emphasis will be placed on the relative importance of contributions to drag for civil and military aircraft. Current techniques include the prediction of skin friction, separation drag, induced drag, wave drag, interference drag and roughness drag. Concepts for drag reduction to be presented include: laminarization, transition and turbulence control, flow control by blowing, suction, strakes, compliant or vibrating walls, special walls, and surface characteristics.

Course Director: Dr A.S.W.Thomas, Lockheed — Georgia, USA.

— FDP Special Course No.2 on Cryogenic Technology for Wind Tunnel Testing

The Course will be held at the von Kármán Institute, in Belgium, on 22—26 April, 1985, and will cover material related to cryogenic wind tunnel design and operation, including safety and economic considerations. It will also present the state-of-the-art on model design and on instrumentation for cryogenic wind tunnels. A review of the status of the cryogenic facilities in AGARD countries and in the rest of the world will be presented.

Course Director: Dr R.A.Kilgore, NASA Langley Research Center, USA.

— FMP Special Course No.3 on Flight Test Instrumentation

The course will be held at the Cranfield Institute of Technology in the UK in May 1985.

In 1975 the FMP Sponsored a Course on Flight Test Instrumentation at Cranfield. The aim of the course was to provide FTI engineers with both the theory and practical applications of instrumentation techniques, and classroom instructions was enhanced by flight experience in the Institute's laboratory aircraft.

Further courses were held in 1977, 1981 and 1983, at DFVLR Braunschweig, Delft University of Technology, and Cranfield, respectively.

Funding from the AGARD Consultant and Exchange Programme will support four to six lecturers. The remaining costs will be met by a course fee paid by each participant.

Course Director: Dr Eshelby, UK.

LECTURE SERIES

Because of the necessity to keep to the same level of effort concerning the number of presentations, and in spite of the large number of requests received from the NATO nations, the Consultant and Exchange Programme, on the basis of proposals made by the AGARD Panels, proposes to hold only six Lecture Series at eighteen locations. (This has been the average over the past ten years.)

The proposed 1985 Lecture Series are described in the following text.

The budget proposed for 1985 includes the printing of the Lecture Series publications as well as the preparation of the Lecture Series: travel, subsistence allowance and honorarium, when appropriate, for participating speakers.

Lecture Series No.138 (AMP) — THE IMPACT OF PROPOSED RADIO FREQUENCY RADIATION STANDARDS ON MILITARY OPERATIONS — April 1985 Portugal/France/Italy

This Lecture Series on Special Clinical and Physiological Problems will feature the following topics:

- the interaction of radio frequency radiation and biological systems;
- thermal physiology associated with the interaction of radio frequency radiation and the body;
- summary of biological effects on the body of radio frequency radiation;
- development of current standards and how they will operationally impact on NATO (a practicum on measuring radio frequency radiation effects will also be featured); and
- overall medical effects resulting from the introduction of proposed radio frequency radiation standards.

A round-table discussion will be held at the end of the presentations.

Lecture Series Director: Mr G.Mitchell, USA

Lecture Series No.139 (FMP) — HELICOPTER AEROMECHANICS — May 1985 Germany/Italy/USA

The objective of the proposed Lecture Series is to report on the state of the art and the modern trends in the field of helicopter aeromechanics supporting military helicopter operations as well as the impact of military applications on rotorcraft-design.

The following main themes are included:

- introduction and historical review;
- rotorcraft aerodynamics;
- dynamics of advanced rotor systems;
- Mission requirements and handling qualities;
- the role of simulation;
- flight testing for performance and flying qualities;
- parametric trends and optimization; and
- advanced systems.

A round-table discussion will be held at the end of the presentations.

Lecture Series Director: Prof. Reichert, Germany.

Lecture Series No.140 (PEP) — 3-D COMPUTATION TECHNIQUES APPLIED TO INTERNAL FLOWS IN PROPULSION SYSTEMS — June 1985 Italy/Germany/France

The Lecture Series will cover the following topics:

- 3-D computation codes for inviscid flows, viscous flows and reacting flows.
- secondary flows considered in a fully 3-D manner.
- unsteady effects in 3-D flows (blade passing, stall...)
- flows in inlets and nozzles, distorted flows.
- comparison between fully 3-D and quasi 3-D computation, and between computational results and test data.
- evaluation of the possibility of use of available computers and the need for new computers.
- evaluation of computer time required; comparison with quasi 3-D computation times.

The Lecture Series will apply to axial and radial compressors and turbines, combustion chambers, rocket engines, ejectors and nozzles.

A round-table discussion will be held at the end of the presentations.

Lecture Series Director: Mr Meauze, France.

Lecture Series No.141 (SMP) — MANAGEMENT OF CORROSION — June 1985 Turkey/UK/Canada

The lecture series will cover the following areas:

- environmental corrosion aspects of each system;
- vehicle design to avoid corrosion;
- shipboard corrosion protection system;
- optimized maintenance scheduling for aircraft with respect to risk;
- discussion and examples of local needs and problems provided by the host country. (The lecture team will provide suggested solutions.)
  (If specially requested electric/electronic corrosion control procedures will be added.)

A round-table will be held at the end of each presentation.

Lecture Series Director: Prof. Summitt, USA.

Lecture Series No.142 (AVP) — ROBOTICS AND ARTIFICIAL INTELLIGENCE — September 1985 Norway/Netherlands/Portugal

This Lecture Series will cover the following areas:

- robotics: past, present and future
- sensors: vision, tactile
- software for robotics
- solid modelling
- robotic control
- mobile robots
- industrial application of robotics
- avionics applications of robotics
- artificial intelligence: status and potential
- expert systems; status and potential
- applications of artificial intelligence
- avionics applications of artificial intelligence

A round-table discussion will be held at the end of the presentations.

Lecture Series Director: Mr L.Gerhardt, USA.

Lecture Series No.143 (GCP) — FAULT-TOLERANT SOFTWARE/ HARDWARE ARCHITECTURE FOR FLIGHT-CRITICAL FUNCTIONS — October 1985 USA/Denmark/Greece

This Lecture Series will cover the following topics:

- advances in software theory and applications
- fault-tolerant algorithms
- architectural emulation techniques
- computation distribution techniques
- information distribution techniques
- design and test experience

A round-table discussion will be held at the end of the presentations.

Lecture Series Director: Dr Cunningham, USA.

LECTURE SERIES PUBLICATIONS – 1985

Lecture Series No.	*Panel*	*Title*	*Projected Publication Date*
LS 138	AMP	The impact of proposed radio frequency radiation standards on military operations	March
LS139	FMP	Helicopter aeromechanics	April
LS140	PEP	3-D computation techniques applied to internal flows in propulsion systems	May
LS 141	SMP	Management of corrosion	May
LS 142	AVP	Intelligence and robotics	August
LS 143	GCP	Fault-tolerant software/hardware architecture for flight-critical functions	September

SUPPORT PROGRAMME TO GREECE, PORTUGAL AND TURKEY – 1985

Maintaining a National Delegates Board decision, this budget item combines into one programme the support of panel members' attendance at AGARD panel meetings, formerly called "Support to Nations", and the support of projects undertaken by Greece, Portugal and Turkey in collaboration with other nations in the Alliance, formerly called "Additional Support to Greece, Portugal and Turkey". A 5.6% increase in the overall funding level is proposed.

In 1985 the plan is to support in attendance at AGARD panel meetings a high level of panel members from each of Greece, Portugal and Turkey. As in 1984 this support will provide travel and subsistence for those panel members who are unable to be funded by their respective nations.

The support of collaborative projects began in 1981 with funding of 500,000 French francs and was subsequently increased in real terms, by 250,000 French francs in both 1982 and 1983. The allowance for inflation brought the funding level in 1984 to 1,778,000 French francs. The support will mainly consist of payments of travel and subsistence costs to enable participants to engage in collaborative projects which range from simple travel support to paper presentors at AGARD symposia to laboratory experimentation and development.

The proposed function for this *total* effort in 1985 is approximately 2,182,000 French francs (in terms of 1984 value).

MILITARY COMMITTEE STUDIES

AEROSPACE APPLICATIONS STUDIES COMMITTEE

Chairman: Mr C.COXHEAD, UK

MILITARY COMMITTEE STUDIES DIVISION

Chief: Colonel V.CLINE, US
Deputy: Colonel J.BEAUGRAND, France
Deputy: Mr A.WOWK, Germany

PROGRAMME

Two studies were begun in 1984: AAS-20 "Anti-Tactical Ballistic Missile System Concepts" and AAS-21 "C³I Requirements for the Attack of Mobile Targets by Land Based and Air Launched Weapons". AAS-22 "System Concepts for the Suppression of Enemy Ground to Air Defences in Aid of Offensive Air Support Operations" was selected by the Steering Committee. The first meeting of the Study Group will be held in January 1985. Topics for additional studies will be reviewed by the AASC and will be submitted to the AGARD Steering Committee in March 1985 for consideration.

MEETINGS

AASC Meeting No.28 (Classified)	– Define Final Terms of Reference for AAS-23 and 24 – Organize Study Group for AAS-23 – Review AAS-21 and 22	27–29 May 1985 Greece
AASC Meeting No.29 (Classified)	– Review Terms of Reference for New Studies – Organize Study Group for AAS-24 – Review AAS-22 and 23	11–13 November 1985 USA

PUBLICATIONS

Subject	*Projected Publication Date*
Attack and Defence of Helicopters Conducting Tactical Operations Volume I (English and French), Volume II (English) (AAS-18) Advisory Report (NATO Secret)	February 1985
All-Weather Capability of Combat Aircraft Volume I (English and French), Volume II (English) (AAS-19) Advisory Report (NATO Secret)	February 1985
Anti-Tactical Ballistic Missile System Concepts Volume I (English and French), Volume II (English) (AAS-20) Advisory Report (NATO Secret)	August 1985

HEADQUARTERS

OFFICE OF THE DIRECTOR

MEETINGS

58th NATIONAL DELEGATES BOARD MEETING 36th STEERING COMMITTEE MEETING 38th PANEL CHAIRMEN MEETING 15th NATIONAL COORDINATORS MEETING	21–22 March 1985 Paris, France
21st AGARD ANNUAL MEETING 59th NATIONAL DELEGATES BOARD MEETING 37th STEERING COMMITTEE MEETING 39th PANEL CHAIRMEN MEETING	18–20 September 1985 Brussels, Belgium

PUBLICATIONS

Subject	*Projected Publication Date*
AGARD Bulletin 85/1	March 1985
AGARD Bulletin 85/2	September 1985
AGARD Highlights 85/1	March 1985
AGARD Highlights 85/2	September 1985
Calendar of Selected Aeronautical and Space Meetings 85/1 and 85/2	June 1985 December 1985

III – BUDGET SUMMARY

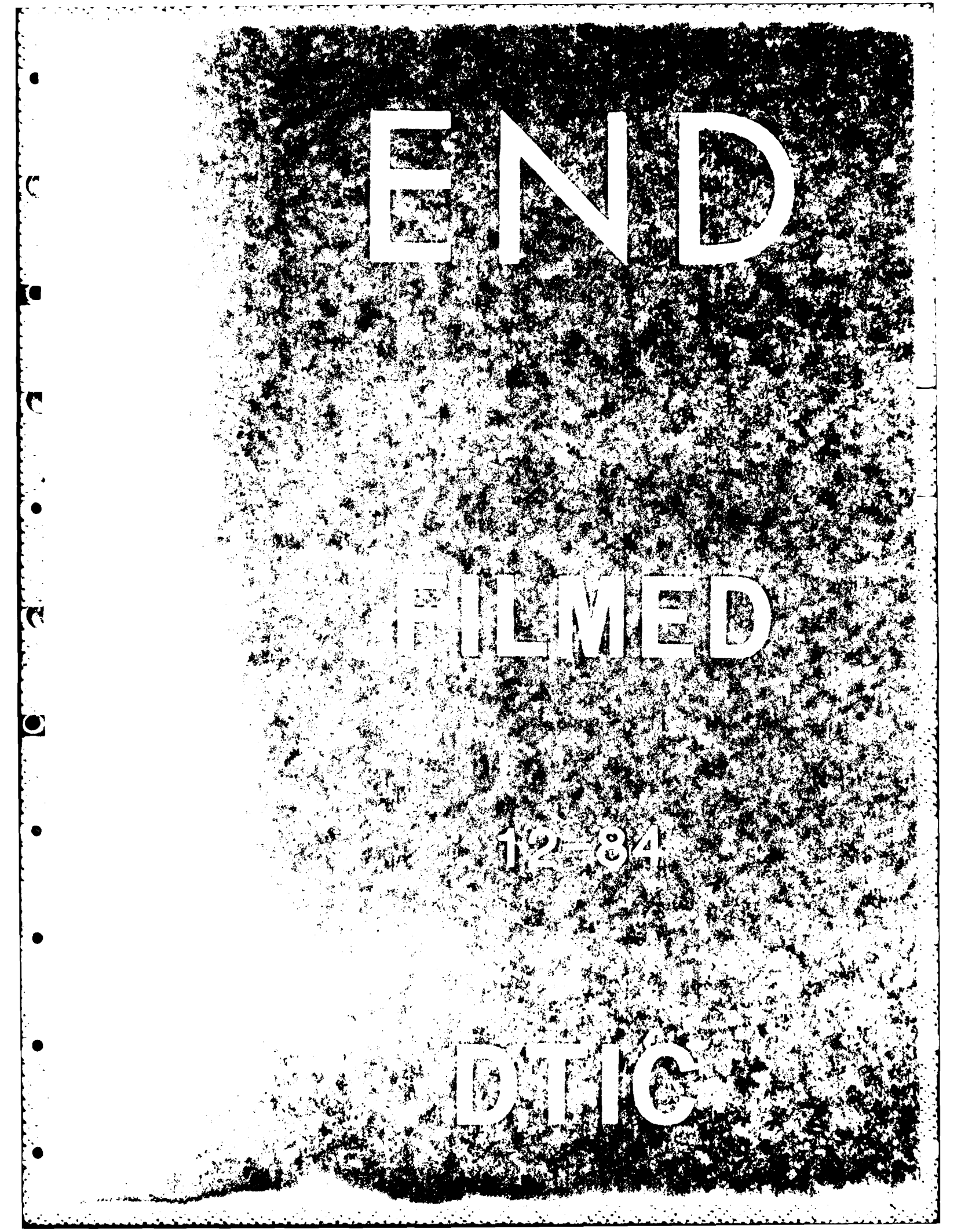
1985 TECHNICAL PROGRAMME

(In Thousands of 1984 French Francs)

Panels	**1983** *Commitments*	**1984** *MBC Approved*	**1985** *Proposed*
AMP	313	261	247
AVP	202	375	366
EPP	331	334	339
FMP	512	610	401
FDP	645	787	734
GCP	253	518	474
PEP	425	499	600
SMP	519	544	644
TIP	179	215	383
SUB-TOTAL – PANELS	3,379	4,143	4,188
INDIVIDUAL CONSULTANTS	819	769	769
LECTURE SERIES	1,295	1,412	1,412
SUPPORT TO GREECE, PORTUGAL & TURKEY	1,699	1,778	1,878
MILITARY COMMITTEE STUDIES	252	165	114
HEADQUARTERS PUBLICATIONS	232	225	231
OTHER COSTS (Certificates, Layout Sheets, Forms, Meeting Announcements, Distribution)	424	508	508
SUB-TOTAL – OTHERS	4,721	4,857	4,912
AGARD TECHNICAL PROGRAMME GRAND TOTAL	8,100	9,000	9,100

IV — 1985 PUBLICATIONS SUMMARY

Activity	*Reports*	*Advisory Reports*	*AGARDographs*	*Conference Preprints*	*Conference Proceedings*	*Misc*	*Total*
AMP	—	—	3	—	3	—	6
AVP	—	1	—	2	2	—	5
EPP	—	1	—	2	2	—	5
FMP	—	2	4	—	2	—	8
FDP	—	2	2	2	1	2	9
GCP	—	2	2	—	4	—	8
PEP	—	1	1	3	2	—	7
SMP	—	1	1	—	4	—	6
TIP	1	—	—	1	1	—	3
CPP	—	—	—	—	—	6	6
MCS	—	9	—	—	—	—	9
HQ	—	—	—	—	—	6	6
TOTALS	1	19	13	10	21	14	78


END
FILMED
12-84
DTIC